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PDRIC ACCESSION NUMBER

LEVEL.

INVENTORY

DOCUMENT IDENTIFICATION

DISTRIBUTION STATEMENT

DISTRIBUTION STAMP

19981223 057

DATE RECEIVED IN DTIC

REGISTERED OR CERTIFIED NUMBER

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-FDAC

HC
12-18-78
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APPENDIX 21
DATA RECORDING WITH STE
FINAL SOFTWARE REPORT
DATA ITEM NO. A005

**INTEGRATED ELECTRONIC WARFARE SYSTEM
ADVANCED DEVELOPMENT MODEL (ADM)**

1800967-21
PREPARED FOR:
NAVAL AIR DEVELOPMENT CENTER
WARMINTON, PENNSYLVANIA
CONTRACT N62269-75-C-0070

RAYTHEON
ELECTROMAGNETIC
SYSTEMS DIVISION

APPENDIX 21
DATA RECORDING
FINAL SOFTWARE REPORT
DATA ITEM A005

INTEGRATED ELECTRONIC WARFARE SYSTEM (IEWS)
ADVANCED DEVELOPMENT MODEL (ADM)

Contract No. N62269-75-C-0070

Prepared for:
Naval Air Development Center
Warminster, Pennsylvania

Prepared by:
RAYTHEON COMPANY
Electromagnetic Systems Division
6380 Hollister Avenue
Goleta, California 93017

1 OCTOBER 1977

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LEXINGTON, MASS. 02173

CODE IDENT NO.

SPEC NO.
53959-DB-0771

49956

1 SHEET
OF REV

TYPE OF SPEC

Operation Manual

TITLE OF SPEC

Data Recording

FUNCTION	APPROVED	DATE	FUNCTION	APPROVED	DATE
WRITER	D. Bailey	6/17/77			

REVISIONS

CHK	DESCRIPTION	REV	CHK	DESCRIPTION	REV

REVISION

SHEET NO.

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FIGURE 1 SYSTEM TEST EQUIPMENT DATA FLOW

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I. INTRODUCTION

THE DATA RECORDING PROGRAM IS DESIGNED TO PERFORM THE FOLLOWING TASKS:

- A) STORE SYSTEM CONTROLLER DATA MESSAGES
- B) SELECTIVELY OUTPUT RECEIVED DATA
- C) SEND COMMANDS TO THE SYSTEM CONTROLLER
- D) SIMULATE THE INS

II. PROGRAM DESCRIPTION

THE DATA EXTRACTION PROGRAM CONSISTS OF FOUR SETS OF ROUTINES:

- A) PROCESSOR 1 ROUTINES
- B) PROCESSOR 2 ROUTINES
- C) COMMON UTILITY ROUTINES
- D) DATA BASE

PROCESSOR 1 PROVIDES THE COMMUNICATIONS WITH THE OPERATOR AND I/O DEVICES. IT ALSO DOES THE CONVERSION OF INFORMATION FROM BINARY TO ASCII AND THE FORMATTING OF THIS DATA.

PROCESSOR 2 PROVIDES THE COMMUNICATIONS WITH THE SYSTEM CONTROLLER.

COMMON UTILITY ROUTINES ARE SHARED BY BOTH PROCESSORS AND PROVIDE THE DATA MANAGEMENT FUNCTION.

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DATA BASE CONTAINS THE FLAGS, MESSAGES, POINTERS, BUFFERS AND TABLES FOR THE PROGRAM. THE FLAGS ENABLE THE CONTROL ROUTINES USED FOR DATA STORAGE. THE MESSAGES ARE THE ERROR MESSAGES AND OPERATOR ALERTS. THE POINTERS PROVIDE THE SHORT AND LONG BLOCK FREE QUEUES AND THE FIVE QUEUES USED FOR INTERPROCESSOR COMMUNICATIONS:

- A) RAW DATA QUEUE
- B) DISPLAY DATA QUEUE
- C) LIST DATA QUEUE
- D) RECORD DATA QUEUE
- E) COMMAND QUEUE

THE BUFFERS PROVIDE THE DATA STORAGE FOR COMMUNICATIONS WITH THE OPERATING SYSTEM, SYSTEM CONTROLLER, AND THE UTILITY ROUTINES. THE TABLES PROVIDE THE INS DATA STORAGE, OPERATOR COMMANDS, OUTPUT FORMAT FOR EACH OP CODE, SPECIAL OPERATIONS, AND OP CODE MESSAGE CONTROL QUEUE POINTERS.

III. PROGRAM OPERATION (SEE FIGURE 1)

A. THE SYSTEM CONTROLLER GENERATES A DATA EXTRACTION MESSAGE WHICH INCLUDES AN OP CODE, A TRACK FILE NUMBER, TIME, AND DATA. THIS MESSAGE IS SENT TO THE SYSTEM TEST EQUIPMENT DATA EXTRACTION PROGRAM VIA A CYCLIC BUFFER IN PROCESSOR 2. HOW PROCESSOR 2 HANDLES THESE MESSAGES IS BASED UPON THE OPERATOR EITHER ENABLING THE CONTROL ROUTINES OR PLACING AN ENTRY INTO THE CONTROL QUEUE TABLE. THE OPERATOR HAS THE OPTION OF SELECTING 1) ALL MESSAGES, 2) MESSAGES BY OP CODE, 3) MESSAGES BY OP CODE AND TRACK FILE NUMBER, 4) MESSAGES BY OP CODE, TRACK FILE NUMBER, AND COUNT. THE OPERATOR ALSO MUST SELECT THE OUTPUT DEVICE FOR EACH MESSAGE, 1) OPERATOR CONSOLE, 2) LST 1, OR

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3) BIN 2. LST 1 AND BIN 1 ARE ASSIGNED TO AN I/O DEVICE VIA THE FLOPPY DISK OPERATING SYSTEM WHICH INCLUDES:

- 1) CONSOLE (TYP)
- 2) FLOPPY DISK A (FDA)
- 3) FLOPPY DISK B (FDB)
- 4) PAPER TAPE PUNCH (PTP)
- 5) SERIAL LINE (SLO)
- 6) SERIAL LINE 1 (SLO1)
- 7) NOTHING (NOP)

THE OPERATOR ALSO HAS THE OPTION OF SENDING ALL RAW DATA TO BIN 2 WHICH MUST BE ASSIGNED TO ONE OF THE I/O DEVICES ABOVE.

B. WHEN PROCESSOR 2 RECEIVES A MESSAGE FROM THE SYSTEM CONTROLLER, THE PROGRAM ATTEMPTS TO PLACE THE MESSAGE ON THE DISPLAY, LIST, OR RECORD QUEUE WHICH IS USED BY PROCESSOR 1. PROCESSOR 2 CHECKS THE CONTROL ROUTINES, SPECIAL OPERATION TABLE, AND THE OP CODE CONTROL QUEUE TABLE. THE CONTROL ROUTINES, ENABLED BY THE "SF" COMMAND, PLACES ALL MESSAGES ON THE APPROPRIATE QUEUE. IF AN OPERATOR ENTRY IS MADE IN THE OP CODE CONTROL QUEUE TABLE, THE CONTROL ROUTINES ARE DISABLED AND THE CONTROL TABLE IS USED. THIS TABLE, LOADED BY THE "DS," "PR," OR "RD" COMMANDS, CONTAINS DATA WHICH SELECTS WHICH QUEUE, WHICH OP CODE, WHICH TRACK FILE NUMBER, AND THE MESSAGE COUNT REQUIRED FOR AN OUTPUT. THE "AF" COMMAND DISABLES THAT PORTION OF THE TABLE WHICH CHECKS THE TRACK FILE NUMBER AND COUNT. IF A MATCH BETWEEN THE MESSAGE AND THE CONTROL TABLE DOES NOT EXIST, THE DATA IS EITHER PLACED ON THE RAW DATA QUEUE, IF IT IS ENABLED, OR DISCARDED. THE SPECIAL OPERATIONS TABLE, WHICH IS ALWAYS CHECKED BY THE PROGRAM, PROVIDES THE CAPABILITY TO

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CALL A SPECIAL ROUTINE DEFINED BY THE OPERATOR WHENEVER A SPECIFIC OP CODE IS RECEIVED.

C. PROCESSOR 1 MONITORS THE RAW DATA RECORD, DISPLAY, AND LIST QUEUES FROM PROCESSOR 2 IN THAT ORDER. WHEN A BLOCK IS PRESENT THE REQUIRED ACTION IS TAKEN. RAW DATA IS SENT DIRECTLY TO BIN 2. DISPLAY, LIST, AND RECORD DATA IS FIRST SENT TO A FORMAT ROUTINE BASED UPON THE OPCODE AND THE FORMAT TABLE. EACH FORMAT ROUTINE SEPARATES THE DATA FIELDS AND CONVERTS THE DATA FROM BINARY TO ASCII OR THE DECIMAL EQUIVALENT AND GENERATES AN OUTPUT TO THE OPERATOR, LST 1, OR BIN 2.

D. REVIEW MODE, ENABLED BY THE "RV" COMMAND, ALLOWS THE RAW DATA STORED ON BIN 2 TO BE REVIEWED. THE COMMAND REWINDS BIN 2 AND SENDS THE DATA TO A CYCLIC BUFFER IN PROCESSOR 2 IDENTICAL TO THE BUFFER BETWEEN THE SC AND PROCESSOR 2. THIS ENABLES THE OPERATOR TO GENERATE A SELECTIVE OUTPUT OF THE RECEIVED DATA IN NON-REAL TIME IN THE SAME MANNER AS THE REAL TIME OPERATION.

E. SC EXECUTIVE MESSAGES CAN BE GENERATED BY THE SC OPERATOR VIA THE "DM," "MO," OR "EM" COMMANDS. "DM" SENDS A DUMP MEMORY REQUEST VIA THE COMMAND QUEUE TO PROCESSOR 2, WHICH LOADS THE SC EXEC MESSAGE BUFFER. THIS MESSAGE CREATES AN SC DATA EXTRACTION MESSAGE OF 15 CONTIGUOUS MEMORY LOCATIONS WITHIN IEMS. "MO" SENDS A MODIFIED MEMORY REQUEST WITH THE NECESSARY DATA VIA THE SAME PATH AS DM AND EM. "EM" ALLOWS THE OPERATOR TO CREATE ANY SC EXEC MESSAGE BY THE ENTERED DATA ARGUMENTS.

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F. INS SIMULATION IS CONTROLLED BY THE OPERATOR, WHO ENTERS THE LIMITS AND RATES FOR HEADING, ALTITUDE, PITCH, AND ROLL INTO THE INS TABLE. THIS TABLE IS USED BY PROCESSOR 2, UPON INITIALIZATION, TO LOAD THE INS OUTPUT BUFFER. WHEN THE SC INTERROGATES THE INS BUFFER, PROCESSOR 2 UPDATES THE BUFFER AT THE SPECIFIED RATE, UNLESS THE LIMIT HAS BEEN REACHED FOR EACH PARAMETER.

IV. DATA RECORDING LOAD

- A. LOAD THE FLOPPY DISK OPERATING SYSTEM
- B. LOAD THE LINKING LOADER
- C. START THE OPERATING SYSTEM AND MODIFY THE LINKING LOADER

OPERATING SYSTEM 4/1/77

?UB6000

OPERATING SYSTEM 4/1/77

?ST 1,3D32,0

OPERATING SYSTEM 4/1/77

?ST 1,3D4C,FEE6

OPERATING SYSTEM 4/1/77

? ST 1,3BE0,C700

OPERATING SYSTEM 4/1/77

?ST 1,3BE1,8044

OPERATING SYSTEM 4/1/77

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D. LOAD THE LATEST VERSION OF SYSTEST.BR

AS BIN 1, FDB, 0

?LO

OPERATING SYSTEM 4/1/77

E. ASSIGN THE NEEDED I/O DEVICES

AS BIN 2, FDA RAW DATA OUTPUT

?AS BIN 1, FDB, 1 ASC II RECORD OUTPUT

?AS LST 1, SLO ASC II PRINT OUTPUT

F. START DATA EXTRACTION

?GO 1000

IEW'S DATA EXTRACTION PROGRAM 5/1/77

??

V. DATA RECORDING COMMANDS

A. PRIMARY COMMANDS

GO INITIALIZES AND STARTS PROCESSOR 2

IN INITIALIZES PROCESSOR 1

QU STOPS PROCESSOR 2 AND RETURNS CONTROL
TO OPERATING SYSTEM

B. REVIEW MODE

RV REWINDS BIN 2 AND LOADS INPUT CYCLIC BUFFER

C. MESSAGE CONTROL

*** DEFAULT ALL MESSAGES SENT TO DISPLAY ***

SF <SW1>, <SW2>, <SW3> if SW1=1 RAW DATA TO BIN2
if SW2=1 ASC II DATA TO I. LST1
if SW3=1 ASC II DATA TO I. BIN 1

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DS <OP CODE>, <FILE>, <COUNT> DISPLAY(I,OPLS)
PR <OP CODE>, <FILE>, <COUNT> PRINT (I, LST1)
RD <OP CODE>, <FILE>, <COUNT> RECORD (I, BIN 1)
AF <OP CODE>, <SWITCH> ALL FILES ON =1, OFF =0

EXAMPLES:

DS 80, 1, 1 DISPLAY DATA EXTRACTION POINT MSG 80 FOR
TRACK FILE 1 EVERY TIME
PR 81, 2, 10 PRINT MSG 81 FOR FILE 2 EVERY 10TH TIME
RD 81, 3, 100 RECORD MSG 81 FOR FILE 3 EVERY 100TH TIME
AF 81, 1 PRINT AND RECORD EVERY MSG 81

D. SC MESSAGES

DM <PROC #>, <ADDRESS> DUMP 15 CONTIGOUS MEMORY
LOCATIONS
MO <PROC#>, <ADDRESS>, <ARG 1>, , , , <ARG8> MODIFY UP TO 8
MEMORY LOCATIONS
EM <ARG>, <ARG>, , , , <ARG> CREATE ANY SC MESSAGE
(PROCESSOR NUMBERS: 3=RMP, 4=AP, 5=TG, 6=CP, 7=SS)

E. INS CONTROL

HEAD ALT PITCH ROLL

IL FROM, TO, INC, FROM, TO, INC, FROM, TO, INC, FROM, TO,
INC. (IN (LSB = .1°/SEC OR 10 FT/SEC)

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APPENDIX A**OPERATION NOTES**

- 1) WHEN A KEY IS HIT DATA EXTRACTION ENTERS A KEYBOARD ROUTINE WHICH WAITS FOR ANOTHER CHARACTER AND "LOCKS UP" PROCESSOR 1. ONLY A "RETURN" WILL ALLOW AN ESCAPE "DELETE" OR "RUB OUT" WILL NOT!
- 2) DATA EXTRACTION WILL STORE 450 MESSAGES IN REAL MEMORY.
- 3) RAW DATA CANNOT BE STORED IN REVIEW MODE.
- 4) WHEN PRINTING A LIST OR RECORD FILE, USE THE SLO OR SLO DEVICE RATHER THAN TYP. SLO AND SLO1 SIMULATES THE PGC WHICH THE FILES WERE DESIGNED FOR.
- 5) WHEN DATA HAS BEEN STORED ON A FLOPPY DISK FILE, THE FILE MUST BE CLOSED VIA THE EF COMMAND IN THE OPERATING SYSTEM.
- 6) WHEN ASCII DATA HAS BEEN STORED ON A DISK, THE COPY "CP" COMMAND IN THE OPERATING SYSTEM MAY BE USED TO OUTPUT THE DATA TO THE PRINTER.
- 7) THE DEFAULT CONDITION FOR OPERATOR INPUTS IS A Ø EXCEPT FOR COUNT WHICH IS A 1.

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APPENDIX B

OPERATION EXAMPLES

1) DISPLAY ALL DATA

GO (START PROCESSOR 2)
(DATA DISPLAYED)

QU (QUIT)

2) DISPLAY, LIST, AND RECORD ALL DATA

GO
SF Ø, 1, 1 (ENABLE: LIST QUEUE COMMAND ROUTINES)

(DATA OUTPUT) (RECORD QUEUE COMMAND ROUTINES)

QU

*** IF DATA IS STORED ON FLOPPY DISK, THE FILE MUST BE CLOSED ***

EF LST1 (CLOSE LIST FILE)

EF BIN2 (CLOSE RECORD FILE)

AS BINL, SL01 (ASSIGN FILE TO OPERATOR CONSOLE)

CP LST1, BIN1 (COPY LIST FILE TO OPERATOR CONSOLE)

3) SAVE RAW DATA AND DISPLAY

GO

SF1 (ENABLE RAW DATA COMMAND ROUTINE)

(DATA DISPLAYED AND SENT TO BIN 2)

QU

*** IF BIN 2 ASSIGNED TO FLOPPY DISK ***

EF BIN 2 (CLOSE RAW DATA FILE)

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4) DISPLAY OP CODE 80 MESSAGES

GO

DS 80,0 (DISPLAY 80 MSGS. FOR TRK 0)

AF 80,1 (ENABLE ALL TRACKS)

(OP CODE B0 MESSAGES DISPLAYED)

QU

5) DISPLAY OP CODE 80 MESSAGES FOR TRACK 1.

GO

DS 80,1 (DISPLAY OP CODE 80, TRK 1)

(OP CODE 80 MSGS FOR TRK 1 DISPLAYED)

QU

6) DISPLAY EVERY 10TH OP CODE 80 MESSAGES FOR TRK 2.

GO

DS 80,2,10 (DISPLAY OP CODE 80, TRK 2, COUNT 10)

(EVERY 10TH 80 MSG FOR TRK 2)

7) DISPLAY EVERY 80 MSG, EVERY 100TH 81 MSG FOR TRK 2,
EVERY 10TH 81 MSG. FOR TRK 3.

RECORD EVERY 84 MSG.

LIST EVERY 85 MSG. FOR TRK 1, 2, AND 3

SAVE RAW DATA

GO

DS 80,0 (DISPLAY 80 MSG'S)

AF 80,1 (DISPLAY 80 MSG'S TRK 2 AND COUNT)

DS 81,2,100 (DISPLAY 81 MSG 'S TRK 2 AND COUNT 100)

DS 81,3,100

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RD 84,0 (RECORD 84 MSG'S)
AF 84,1
PR 85,1 (PRINT 85 MSG'S TRK 1)
PR 85,2
PR 85,3
SF1 (RECORD RAW DATA)

(DATA PROCESSED)

QU

*** CLOSE DATA FILES ON FLOPPY ***

EF BIN 2 (RAW DATA)
EF BIN 2 (RECORD DATA)

8) REVIEW RAW DATA FOR AØ MSG'S FOR TRK 1, THEN FOR TRK 2

GO
DS AØ,1 (DISPLAY AØ MSG'S FOR TRK 1)
RV (REVIEW MODE)

(DATA DISPLAYED)

IN (REINITIALIZE)

GO
DS AØ,2 (DISPLAY AØ MSG'S FOR TRK 2)
RV

(DATA DISPLAYED)

	SORTER	RMP	CP	AP
0	80 PTDW	AO	CO	EO
1	81 NEW Emitter ALERT	A1	C1	UNEXPECTED INTERRUPT
2	82 CAM FILE DUMP	A2	C2	NON-EXIST DRIVER
3	83 AOA READOUT	A3	C3	NON-EXIST DRIVER
4	84 THROTTLE ALERT	A4	C4	MEMORY DUMP
5	85 CONFIRM FILE CREATION	A5	C5	MEMORY DUMP
6	86 ERROR ALERT	A6	C6	MEMORY DUMP
7	87 INACTIVE FILE ALERT	A7	C7	MEMORY DUMP
8	88 LONG PULSE PARAMETERS	A8	C8	MEMORY DUMP
9	89 IB<1/4 FULL	A9	C9	MEMORY DUMP
A	8A IB>3/4 FULL	AA	CA	MEMORY DUMP
B	8B FILES FULL	AB	CB	MEMORY DUMP
C	8C TROTTLER FILES FULL	AC	CC	MEMORY DUMP
D	8D BUS HUNG	AD	CD	MEMORY DUMP
E	8E WATCH DOG TIMER	AE	CE	MEMORY DUMP
F	8F ALR-50	AF	CF	MEMORY DUMP
70	90 NPDW MESSAGE	B0	DO	MEMORY DUMP
71	91 MEMORY DUMP	B1	D1	SYSTEM TEST DRIVER
72	92 MULTIFREQ FLAG	B2	D2	PRIORITY DUMP
73	93 BIT STATUS	B3	D3	ID DUMP
74	TG MEMORY DUMP	B4	D4	WATCH DOG TIMER
75	94	B5	D5	
76	95	B6	D6	
77	96	B7	D7	
78	97	B8	D8	
79	98	B9	D9	
7A	99	BA	DA	
7B	9A	BB	DB	
7C	9B	BC	DC	
7D	9C	BD	DD	
7E	9D	BE	DE	
7F	9E	BF	DF	
	9F		FF	

APPENDIX C. SC OP CODES